of statement is overwhelming. We recognise that it would be unreasonable to ask Prof. Carslaw for an account of the modern theories of integration. We hope, however, that, when next he has an opportunity of preparing a new edition, he will remedy the omission which we have emphasised. He should also certainly include the fundamental theorem that the Fourier constants of any integrable function tend to zero (a rather startling omission), and some account of Parseval's theorem. He would thus add greatly to the value of an already valuable book.

(3) Prof. Hobson gives us the mathematics of 1921, and Prof. Carslaw is not far behind him. Mr. Edwards's book may serve to remind us that the early nineteenth century is not yet dead. He directs our attention to "the admirable and exhaustive works of Legendre, Laplace, Lacroix, Jacobi, Serret, Bertrand, Todhunter, etc."; from which he has learnt, for example, that "a limit may be of finite, infinite, or indeterminate value," that "the processes of integration are necessarily of a tentative nature," and that any convergent series may be integrated term by term. Two proofs are offered of the last proposition. In the first it is stated to be valid "provided the series V itself, and the series V formed by the integrations of the separate terms, are both *absolutely convergent.*" Mr. Edwards italicises the last condition, but we have no idea why it is inserted, for there is no pretence of making any use of it, nor is its meaning explained.

It is difficult for a reviewer to know what to say about such a book, except that it cannot be treated as a serious contribution to analysis. Twenty years ago it might have been necessary to establish the point in detail; it would be waste of time now, when the battle for accuracy has been won. There is always the danger, however, that a student who reads a text-book may suppose that the statements which it contains are true. We should therefore state explicitly that the "general theorems" asserted in this book are often false, and that, even when they are true, the arguments by which they are supported are generally invalid.

One ought, of course, to judge the book by a different standard, as a storehouse of formulæ useful for instructional purposes. Of such there is an abundance, including a good many which are seldom found in other books, and often entertaining or even important. We may mention Catalan's formula for the surface of an ellipsoid, results concerning roulettes and glissettes, the theorems of Fagnano, Burstall, Graves, MacCullagh, Schulz, and others. The book, in short, may be useful to a sufficiently sophisticated teacher, provided he is careful not to allow it to pass into his pupil's hands.

G. H. Hardy.

Greek and Arab in Medicine.

(1) *Greek Medicine in Rome: The FitzPatrick Lectures on the History of Medicine delivered at the Royal College of Physicians of London in* 1909–10, *with other Historical Essays.* By Rt. Hon. Sir T. Clifford Allbutt. Pp. xiv+633. (London: Macmillan and Co., Ltd., 1921.) 30*s.* net.

(2) *Arabian Medicine: Being the FitzPatrick Lectures delivered at the College of Physicians in November* 1919 *and November* 1920. By Prof. Edward G. Browne. Pp. viii+138. (Cambridge: At the University Press, 1921.) 12*s.* net.

SINCE the great revival of historic interest in the eighteenth century the labour of historians has been directed mainly towards political institutions. Sociological and cultural history have been of much slower growth, and we are only now beginning to be able to treat the history of European life as a whole, to look upon it as one majestic panorama developing from the early Mediterranean culture in which first Egypt, then Crete, then Greece was leader, to the time when Rome herself, in receipt of tributary streams from Syria, Persia, Mesopotamia, and India, acted as the cultural intermediary to the European peoples, and, finally, to the diffusion by those peoples of the infectious elements of the ancient tradition throughout the world. It will thus one day become possible to present this panorama with its various aspects in adequate relation to each other. Mr. Marvin, in his "Living Past," and Mr. Wells, in his "Outline of History," have produced tentative sketches in that direction. Such works point to a time when the history of civilisation, the most absorbing of all topics, will form the humane basis of education. There are, however, large departments in which the material is not yet to hand for this consummation. Especially defective is our record of certain aspects of the development of thought. Formal thought, philosophy, has, it is true, found fairly adequate treatment. A real history of religion is, however, still strangely absent, despite the vast literature which professes to deal with that topic, and the history of psychology is very backward. The history of science, too, presents vast gaps which are sometimes vainly treated as though they represented breaches in continuity of the phenomena rather than breaches in our knowledge, and the two works before us represent the efforts of two eminent scholars in two separate departments to establish continuity across these gaps.

(1) Sir Clifford Allbutt has been distinguished for two full generations and more as an exponent alike of modern scientific medicine and of the scientific

record of Greek antiquity. He brings to this volume, the title of which gives but an inadequate idea of its range, an extent of combined knowledge and experience in these departments that is probably unsurpassed by any other man living.

About half of the book, and this probably the more valuable half, deals with the period of creative activity of the Greek genius. Sir Clifford Allbutt pictures, as perhaps only one of his attainments could, the rise of scientific medicine among the Ionian philosophers of the sixth and fifth centuries before the Christian era, and that process of "separation of medicine from philosophy" which made "science" possible. The earlier philosophers set out to give a picture of the universe both internal and external. They failed because they had not as yet concentrated on the parts which go to make the whole. But their attempt corresponded to an eternal necessity of the human mind. Two and a half millennia have passed. Mankind is now overwhelmed with a vast record in which the details of the parts prevent any vision of the whole. Science, philosophy, and history are each split into a hundred special departments, most of them without adequate relation to the others. Eternal necessity asserts itself again, and the human mind calls for attempts at synthesis. The wheel has turned full circle, and the philosophical, the educational, and the scientific demands of the day echo those needs that Thales sought to satisfy six hundred years before the Christian era.

Sir Clifford Allbutt paints on a big canvas and with the great, sure, sweeping lines that come only to those who have lived a long, full life. His work stands alone in the English language as an attempt to portray, both in outline and detail, the development as a continuous whole of Greek biological and medical thought from its early beginnings to its spread to the confines of the Roman Empire, and to its strange transformation by the new point of view introduced by the decay of the pagan political system and the rise of Christian theology.

This is a high theme which can no more be abstracted by the reviewer than can that of a great epic. The work, like every epic, contains inequalities on which it would be alike ungracious and unnecessary to dwell. But it also contains characteristic and inspiring flashes that often raise it to the level of poetry and make it a real addition to English literature. Not the least characteristic and inspiring of these is Sir Clifford Allbutt's treatment of the idea of inspiration itself and its relation to the ancient doctrine of the *pneuma*.

"To-day," says the author, "as we utter the word *inspiration* we still feel the glow of the spirit which, from the ancient legends of the creation of life to the passages of our modern ethereal telegraphy, from the hauntings of the Great Spirit in primeval man, through the storms of superstition, to the haven of the soul in its purest communion with the Divine, has moulded the whole story of man and embedded itself in his tongue. Yet we shall observe again nevertheless in the history of this, as of all spheres of thought, how a living idea gradually becomes so imprisoned in the letter that its liberty is enthralled in its own formulas. Thus as the brilliant Ionian atomic hypothesis dried up into the arid formulas of the Methodists, as Hippocratean wisdom into Dogmatism, as Empiricism into mere rule of thumb, rational scepticism into Pyrrhonism, so the idea of the pneuma was cribbed in the sectarian Pneumatism."

Sir Clifford will soon be entering his eighty-seventh year, but the vigour of this and many other passages in his remarkable book gives good hope that we may expect much further material from his pen, on topics which he, more than any other living man, is capable of treating with full adequacy.

(2) The learned Sir Thomas Adams professor of Arabic in the University of Cambridge takes up the tale where Sir Clifford Allbutt leaves off. With the fall of the Western Empire Greek science remained in the keeping of the East, and it became progressively orientalised with those changes in the outlook of the Eastern world that may be described as *Byzantinisation*. With the spread of Christianity, and with the advent of schism within the Christian Church, Greek science moved yet further east, and, in its medical aspects, at any rate, was cultivated especially by teachers of the Nestorian sect, by whom much Greek material was turned into Syriac. It was through such oriental versions that Greek medicine passed to the keeping of the Arab-speaking world. The overflow from the Arabian peninsula in the seventh century, and the conquest by the Arabs of the whole of the Near East and the whole of North Africa, the Mediterranean islands, Spain and Southern Italy in the centuries which followed, form one of the most dramatic chapters in world history. The Arabs, great as conquerors and organisers, did not, however, excel in science, and nearly all "Arabian" medical works are the products of men of non-Arab race, Persians, Moors, Jews, and others.

The golden age of Arabian learning culminated between A.D. 750 and 850, the century succeeding the establishment of the Abbasid Caliphate with its metropolis at Bagdad. In the thirteenth century Islamic civilisation suffered an injury from which it never recovered, through Tartar invasion, which destroyed for ever the Caliphate, the unity of the Arabian Empire, and the pre-eminence of Bagdad as a centre of learning. With this fall the hegemony of the intellectual world passed to Europe mainly by means of material translated into Latin from Arabic, often through Hebrew. This material had itself been largely translated from Syriac, and the Syriac versions themselves were derived from Greek, so that Greek learning reached the West at third or fourth hand. But between the eighth and the thirteenth centuries science and learning, literature and culture remained, like civil organisation and military power, mainly with the Arabic-speaking peoples who stretched from India and Persia to the Atlantic seaboard. The learning of this period is described as "Arabian," and must be carefully distinguished from the true "Arab" material which comes only from Arabia.

It is certain medical aspects of this great Arabian civilisation with which Prof. Browne here deals. It is a subject with a vast literature that can scarcely be treated, even in outline, in a hundred and thirty pages. Apart from the actual changes which the medical system of Greece underwent in Arabian hands, and besides the actual contributions of Arabian authors themselves, an adequate history of Islamic medicine would need to treat of the psychological basis of those changes arising in part from the social and political circumstances of the time, in part from the racial characteristics of the Islamic peoples, and in part from the philosophy and general outlook prevalent among them.

The time is still distant when it will be possible to do this, and Prof. Browne, in this admirable little book, has essayed a smaller task. He concentrates on the work of a small number of the most important Arabian physicians, and notably on three Persians, known to the medieval Latins under the names of Rhazes, Haly Abbas, and Avicenna, whose works were the main carriers of the Arabian medical traditions to the West. Avicenna's enormous "Canon" is especially of importance as being—perhaps with the exception of the "Aphorisms" of Hippocrates—the most widely read work on medicine that has ever been written. More interesting perhaps to most readers will be Rhazes, whose memorable treatise on smallpox and measles was the first in which these diseases were differentiated. This work was translated by the late Dr. Greenhill in 1848, but, with that exception, Prof. Browne's is, so far as we know, the only modern book on Arabian medicine in the English language based on first-hand knowledge. It will be valued both on that account and as a very lucid and scientific exposition of a subject which very few besides Prof. Browne himself are qualified to treat.

Charles Singer.

Elementary Meteorology.

(1) *The Rainfall of the British Isles.* By M. de Carle S. Salter. Pp. xiii + 295. (London: University of London Press, Ltd., 1921.) 8*s.* 6*d.* net.

(2) *Études Elémentaires de Météorologie Pratique.* By Albert Baldit. Pp. ix + 347. (Paris: Gauthier-Villars et Cie, 1921.) 15 francs net.

(3) *Simple Lessons on the Weather for School Use and General Reading.* By E. Stenhouse. Pp. viii + 135 + 12 plates. (London: Methuen and Co., Ltd., 1921.) 4*s.*

(4) *Handbook of Meteorology: A Manual for Co-operative Observers and Students.* By J. W. Redway. Pp. v + 294. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1921.) 24*s.* net.

(1) IN "The Rainfall of the British Isles" Mr. Salter gives a wealth of information that hitherto could be obtained only by searching through the volumes of "British Rainfall." The present work should therefore appeal to the large public which takes an interest in rainfall, and as some 5000 observers read their gauges daily it will be realised how large that public is. Almost every observer would benefit by a perusal of this work, where he will find a discussion of the problems which he himself is assisting to solve. He will find an account of the various types of gauge, and that some, still in use and still sold by instrument makers, are untrustworthy. He will find the exposure of gauges discussed, and he may improve that of his own. He will learn how the data he supplies are used, and find maps illustrating various types of rain, some almost wholly influenced by orographical features, some by the passage of depressions, and others due to thunderstorms.

The discussion of seasonal variation and annual fluctuation will be read with much interest at the present time. Numerous maps are a great feature of the book, and are most instructive; any one who thinks that his own gauge is worth keeping should study the map of the thunderstorm rain in London on June 16, 1917, and note that there was no rain at the Oval, more than 4½ in. at Kensington, while one end of the Serpentine received less than 1 in. and the other more than 3 in.

The rain over the British Isles seems to fall into a watertight compartment; it is perhaps captious to complain that a book on our own rainfall does not discuss the rainfall of the Continent, but it would be of much interest to know how our rainfall links up with that on the other side of the Channel. Possibly the very excellence of the work of the British Rainfall Organization under Dr. Symons, Dr. Mill, and Mr. Salter himself, has made our own information so adequate that it